

ENGINEERING
DESIGN AND
CONSTRUCTION

CIVIL ENGINEERING

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Santa Fe's Showstopper

ENGINEERING APPLICATIONS

GEOPIERS SHOULDER LOADS IN POOR SOIL

The Maryland State Highway Administration (MSHA) saved \$254,000 by using geopiers, or compacted earth foundations, instead of more traditional grouted minipiles and uplift anchors for a road-widening project on Route 5 in Maryland. The project involved building a 13-ft-high retaining wall in swampy soil.

Geopiers were developed

in 1989 but are just starting to come into widespread commercial use. They are cheaper and easier to install in wet, sandy and silty soil under retaining walls than conventional spread footings on piles or soldier footings with tiebacks, said Daniel Beck, MSHA design engineer. MSHA is building the retaining walls to support acceleration and deceleration lanes for a new interchange, he said.

Geopier installation on the Route 5 project consisted of drilling 36-in.-diameter holes and filling them with layers of gravel aggregate. A patented tamper with a beveled head compacted each 12 to 18 in. layer of fill, forming it into a bulb shape, said Mike Cowell, president

of Geostructures, a geopier contractor in Leesburg, Va.

The beveled tamper causes the fill in each "bulb" to push laterally against the sides of the hole during compaction, creating a stress that causes the surrounding soil to press back against the geopier, said Nathaniel Fox, creator of geopiers and president of Geopier Foundation Co., Stone Mountain, Ga. Lateral stress holds the geopier in place, preventing settling and increasing the geopier's supportive capacity even in poor soil, Fox said. In most projects, geopiers can support pressures up to 7,000 psf, with total settlement of less than 1 in. and differential settlement of less than $1/2$ in., he said.

The 185 geopiers beneath the Route 5 retaining walls were 10 to 18 ft deep and took about 30 to 60 minutes each to install, Cowell said. Crews have needed as little as 15 minutes per geopier at a relatively dry commercial project site in Alexandria, Va., where 2,400 geopiers are being installed to support four multistory buildings. High groundwater at the Route 5 project forced crews to spend extra time lining geopier holes with temporary casings to prevent collapses.

The cost for the geopiers, installed under a 765 ft stretch of 5-ft-wide retaining wall, was \$490,000, compared with \$744,000 estimated by MSHA for conventional foundations, Beck said.

POSITIVE GROUP EFFECT CAUSED BY STRESS REFLECTION OF ADJACENT GEOPIER

